DEFORMABLE INTRAOCULAR LENS

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a deformable intraocular lens which is inserted into the eye in place of the natural lens when the latter is physically extracted because of cataracts.

2. Description of the Related Art

It is generally accepted that when a cataract-impaired lens is surgically extracted, smaller incisions in the eyeball cause less chance of postoperative astigmatism.

Accordingly, a technique called KPE (Kelman's pharmacoemulsification; suction of lens substance crushed by ultrasonic emulsification) using an ultrasonic emulsification/suction apparatus has been developed. With this apparatus, an opaqued lens is crushed and emulsified by ultrasonication, and then sucked for removal. This technique permits an operation in which lenses are extracted through a small incision of approximately 4 mm, as compared to larger incisions of about 10 mm according to the conventional ECCE operation technique (extracapsular cataract extraction).

In connection with the technique which made small incisions possible as mentioned above, intraocular lenses which can be inserted through a small incision have been developed. Conventional intraocular lenses have an optical part made of a hard material such as glass or plastic, and therefore, the incisions prepared at the time of transplant are greater than the diameter of the optical part which are in most cases 6.5 mm or more. Accordingly, even though a lens is extracted through a small incision according to the KPE technique, it is necessary that the incision be enlarged when a hard intraocular lens is inserted.

To solve this problem, Japanese Patent Application No. g 58-1800S (Japanese Patent Application Laid-open (kokai) No. 146346/1983, Japanese Patent Publication No. H 5-58748) discloses a deformable intraocular lens which can be inserted through a small incision made in an eyeball. As shown in FIG. **4** (Prior Art), such an intraocular lens is composed of an optical part **3** made of an elastic material and having predetermined memory characteristics and a plurality of supports **4** which hold the optical part within the eye and which are made of a different material from the optical part **3**. Anchors of the supports **4** are embedded in the optical part **3** for bonding the supports to the optical part.

The optical part **3** can be deformed by rolling, bending, extending or folding to reduce its size. Therefore, an intraocular lens having such an optical part can be inserted through a small incision prepared in the eyeball with a newly developed inserting device which can deform the optical part. With this inserting device, the intraocular lens can be inserted through a small incision of about 4 mm in diameter, and can be restored to its original larger shape within the eye, based on the memory characteristics of the optical part **3**. Thus, neither the size of the intraocular lens itself nor the method of inserting the lens requires the creation of a large incision.

The above-described deformable intraocular lens according to the prior art involves a drawback that the optical part **3** tends to deviate within the eye. When the supports **4** support the deformable optical part **3** within the eye, they are deformed by external force such as compression force, tensile force, etc., and stress such as compression stress generated in the supports **4** are transmitted to the optical part **3** to generate strains or deformation in the areas **3***a* of the concave lens shown by the chain lines in FIG. **4**, which areas are close to the positions at which the anchors **4***a* of the supports **4** are embedded.

SUMMARY OF THE INVENTION

The present invention addresses the above-mentioned problems by providing a deformable intraocular lens which does not cause deviation or decentralization of the optical part when the tails of the supports are deformed by external force.

According to the present invention, there is provided a deformable intraocular lens comprising a deformable optical part which is made of an elastic material and which has predetermined memory characteristics, and a plurality of supports which are made of a material different from that of the optical part and which are bonded to the optical part, each of the supports having, in a serial integration, a flexible tail, a rigid base which cuts off the transmission of stress generated by the deformation of the tail to the optical part, and an anchor which binds the support to the optical part, wherein the transitional part of the tail and the base is disposed at a position outside of the optical part.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a plan view showing a deformable intraocular lens according to a first embodiment of the present invention;

FIG. **2** is an enlarged plan view showing a portion of the deformable intraocular lens of FIG. **1**;

FIG. **3** is an enlarged plan view showing a portion of the deformable intraocular lens according to a second embodiment of the invention; and

FIG. **4** (Prior Art) is an enlarged plan view showing a portion of a deformable intraocular lens according to the prior art.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

A first embodiment of the present invention will be described while referring to FIGS. **1** and **2**.

In FIGS. **1** and **2**, numeral **1** denotes an optical part made of a molded deformable elastic material which has predetermined memory characteristics and which has an approximately round front view. The optical part **1** is provided with a pair of reinforcing sections **1***a* at the right-upper position and the left-lower position in FIG. **1**. They protrude from the optical part **1**, and form an approximately right angle at each of the protruding corners.

Numeral **2** denotes a support made of a flexible material which is different from the material used for the optical part **1**. Each of the supports **2**, **2** is composed of a base **2***a* which is relatively wide and thick, an arcuate anchor **2***b* which is integrally formed with the base **2***a*, and a tail **2***c* which has a small width and which is integrally connected to the base **2***a*.

Two supports **2**, **2** are provided to form the optical part **1**. The substantial part of the base **2***a* and the anchor **2***b* are embedded in and bonded to the reinforcing section **1***a* and the peripheral portion of the optical part **1** at a slightly inner position of the protruding reinforcing section **1***a*, respectively. The outer periphery of the base **2***a* is extended in parallel to one side of the reinforcing section **1***a* as shown in